Hypoglycemia Prevention and Management - Measurement that Matters and the Power of Collaboration

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Director, UCSD Center for Innovation and Improvement Science
CMO, Society of Hospital Medicine
Session 3 of 4: NYSP4P Initiative

Where discoveries are delivered.SM
Greg Maynard - Conflict of Interest Statement

• AHRQ grants to improve glycemic control and reduce hypoglycemia

• SHM CMO - SHM is not-for-profit that offers some products for glycemic control QI initiatives and measurement tools. No personal fiscal COI.
Session I - Feb 12th  Dr. Greg Maynard
- Why inpatient glycemic control is important
- Overview of IV and SC insulin best practices, how to implement
- Framework for Improvement

Session II - Feb 26th  Dr. Kristi Kulasa
- Inpatient glycemic team structure -
- Coordination of meals / insulin / testing
- Top things we teach / reinforce
- Basal / bolus cases and special situations (TPN, TF, NPO, Steroids, Transition IV to SC insulin)

Session III - March 12th  Dr. Greg Maynard
- Safe use of insulin summary
- Hypoglycemia Management and Prevention
- Measurement and Monitoring – month to month and day to day
- SHM and other resources

Session IV - March 19th  Drs. Kulasa and Maynard
- FAQs / Q&A
- Transitions
- Barriers and How to Overcome Them
Essential Elements

Successful PI Efforts

- Institutional support – buy in
  - Staff engagement and training
  - Standardization of order sets, help with measures
- Teams and Culture of Improvement
- Understand Current Process
- Willingness to Redesign process
- Defined goals
- Metrics – reliable, practical, rapid feedback
- Guidance in order sets and other venues
- Hardwire - Reliable Interventions
- Ongoing informed improvement
- Educational programs
NYSPFP GUIDING PRINCIPLES
FOR THE REDUCTION OF ADVERSE DRUG EVENTS & MEDICATION SAFETY

**INNOVATE**
Test new processes or protocols, organization or team approaches, hand-offs, and pharmacy-led or managed interventions.

Use smart infusion pumps for IV medication administration of all high risk medications (e.g., opioid PCA, epidural, antithrombotics, platelet inhibitors, insulin) with functionality employed to:
- Intercept and prevent wrong dose errors.¹
- Intercept and prevent wrong infusion rate errors.

Develop an internal business case for reorganized processes, including the establishment of a hospital-based medication management team. For example, this may include analyses of the potential reduction of waste (i.e. time, resources), the mitigation of risk, and the value of positive outcomes.

**ENGAGE**
Engage pharmacists in a pharmacy-led medication reconciliation and counseling process for high-alert drugs.
- Engage pharmacists in the medication reconciliation process on admission and at discharge.
- Establish a process to review medication orders at the time of transition for accuracy, necessity, potential side effects, and/or interactions for patients.

Confirm that the facility’s patient and family education on anticoagulants, hypoglycemic agents, and opioids includes, at a minimum, indication, symptoms for monitoring, dietary issues, drug interactions, disease interactions, monitoring requirements, duration of therapy and potential adverse effects.

Incorporate a teach-back methodology into the facility’s routine patient and family medication education process. Improve dissemination and sharing of strategies and results from your facility’s quality improvement initiatives targeted at adverse drug event prevention across all levels of staff, and with other stakeholders.²

Ensure leadership sponsorship for the re-design of more effective processes to reduce ADEs.

**INTEGRATE**
Establish hospital-based, high-alert drug management teams (for opiates, insulin, and anticoagulants) that include or are led by a pharmacist, or pharmacy technician.
- Ensure venous thromboembolism (VTE) reduction team(s) efforts are aligned closely to anticoagulant-related adverse drug event (ADE) prevention efforts.
- Ensure the integration and alignment of team efforts related to insulin management in developing and implementing standard processes and protocols for managing insulin in the surgical, critical care, and pharmacy departments.
- Ensure that ventilator-associated event (VAE) and delirium reduction teams, as well as pain management teams, are coordinating with all opioid-related ADE prevention efforts.

Integrate specific improvement goals for high-alert drugs into existing care transition models and processes.

Promote a multidisciplinary, coordinated, and systematic approach to inpatient medication management, e.g., “Anticoagulation rounds,” pharmacist-nurse-managed medication management services, “Anticoagulation Stewardship,” and “culture of safety” around medication management.³

**HARDWIRE**
Develop and implement standard policies and practices for managing the initiation and maintenance of anticoagulation, insulin, and opioid therapy.
- Establish processes for addressing lab results that are out of the normal range in a timely manner.
- Develop opiate rescue protocols.
- Develop a process for the implementation of VTE prevention recommendations post high-risk screening.
- Utilize basal-bolus insulin management protocols.

Build internal systems to capture data on relevant ADE process and outcome measures to track performance over time.
- Develop EHR tools to enable provider access to real-time, integrated pharmacy-laboratory data to facilitate seamless access to pertinent medication and laboratory data and optimal inpatient medication management.
- Track adherence to protocols across all patients.

Implement clinical decision support tools specific to medication management.

Establish and/or utilize post-hospital Coumadin or anti-coagulation, pain management, or diabetes self-education clinics.⁴
Enhancing insulin-use safety in hospitals: Practical recommendations from an ASHP Foundation Expert Consensus Panel


Table 1. Expert Panel-Identified High-Priority Insulin Errors, by Phase of Medication-Use Process

<table>
<thead>
<tr>
<th>Phase</th>
<th>Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prescribing</td>
<td>Incorrect dosage/irrational insulin orders</td>
</tr>
<tr>
<td></td>
<td>Nomenclature-related errors</td>
</tr>
<tr>
<td>Transcribing</td>
<td>Incorrect transcription of verbal or telephone orders</td>
</tr>
<tr>
<td></td>
<td>Transcription of an incorrect dose</td>
</tr>
<tr>
<td>Dispensing and storage</td>
<td>Failure to double-check insulin products (i.e., predadministration)</td>
</tr>
<tr>
<td></td>
<td>Look-alike containers</td>
</tr>
<tr>
<td></td>
<td>Unsecure and/or non-segregated storage in patient care areas and/or pharmacy areas</td>
</tr>
<tr>
<td>Administering</td>
<td>Administration of incorrect doses</td>
</tr>
<tr>
<td></td>
<td>Incorrect use of insulin pens</td>
</tr>
<tr>
<td></td>
<td>Name confusion</td>
</tr>
<tr>
<td></td>
<td>Relationship of insulin administration to nutrition</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Failure to appropriately monitor for insulin effects and adjust dose accordingly</td>
</tr>
</tbody>
</table>
Prescribing: Recommendation 1

Develop protocol-driven and evidence-based order sets for specific uses of insulin:
- IV to Subcutaneous insulin transitions
- Administration via subcutaneous insulin pumps
- Post-discharge / transition regimens
- DKA and hyperosmolar states
- Hyperkalemia
- Post-cardiac surgery care
- Integrated hypoglycemia management orders

Include decision-support to guide insulin use based on patient’s nutritional status and for appropriate monitoring

Prescribing: Recommendation 2 and 3.

Recommendation 2
Eliminate the routine administration of correction / sliding scale insulin doses as the primary strategy to treat hyperglycemia

Recommendation 3
Eliminate the use of “free text” insulin orders in electronic and paper records.

Replace them with protocol-driven and evidence-based order sets that allow for the prescribing of complex insulin regimens.
Storing and Dispensing:

Recommendation 4
Store only U-100 concentration insulin and U-100 administration devices (e.g., syringes, pens) in patient care areas and ensure they are stored in a secure fashion and segregated from other medications.

Recommendation 5
Develop hospital-wide standard concentrations for insulin infusions to be adopted and used in all patient care areas.
Administering:

Recommendation 6
Limit preparation, including for procedural areas, of all intravenous bolus insulin doses and intravenous insulin infusions to the pharmacy department.

Recommendation 7
Hospitals must develop policies and procedures to ensure that insulin pens are used for individual patients only. In addition, hospitals must establish policies and educational programs to ensure the safe use of insulin pens and disposable needle tips.
Monitoring: Recommendation 8

Ensure that insulin use is linked directly to patients’ nutrition status. Meal delivery, point-of-care glucose testing, and insulin administration should be well coordinated and standardized. Patients and family care-givers should be educated to request administration of RAA-I when patient begins her/his meal. In patients with variable nutritional intake, prandial insulin administration should be delayed until completion of the meal.

Protocol-driven and evidence-based order sets should be developed for insulin-use and blood glucose monitoring during planned and unplanned interruptions of enteral nutrition or total parenteral nutrition.
Evaluating: Recommendation 9

Every hospital should prospectively monitor/measure:

– rates of hypoglycemia and hyperglycemia
– Insulin use patterns
– Coordination of insulin administration, glucose testing, and nutrition delivery

Real-time, institution-wide glucose reports should be provided to health care team members to ensure appropriate surveillance and management of patients with unexpected hypoglycemia and hyperglycemia
Planning: Recommendation 10

Provide standardized education, including competency assessment, to all hospital-based health professionals who are responsible for the use (e.g., prescribing, compounding, dispensing, administering, monitoring) of insulin.
Iatrogenic Hypoglycemia
A Top Source of Inpatient Adverse Drug Events (ADEs)

- ADEs are most common cause of inpatient complications
  - affecting 1.9 million stays annually
  - costing $4.2 billion / year
  - responsible for 1/3 of hospital acquired conditions (HACs).
- 50-60% of ADEs are preventable
- 57% of ADEs are from hypoglycemic agents
- > 10% of those on a hypoglycemic agent suffer at least one hypoglycemic ADE

Hypoglycemia Risk Factors - Different Flavors

Inherent
- Low BMI / cachexia / Advanced Malignancy / Age
- Liver / Kidney disease / CHF

Iatrogenic
- Insulin / oral agents
- Some risk with appropriate use.
- Risk magnified with inappropriate use or failure to react / anticipate preventable problems.
- Overly aggressive targets, inappropriate prescribing

Improved Glycemic Control AND Reduced Hypoglycemia possible.
Iatrogenic Hypoglycemia

<table>
<thead>
<tr>
<th>Etiologic factor</th>
<th>% of hypo cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in enteral intake</td>
<td>40</td>
</tr>
<tr>
<td>Insulin adjustment</td>
<td>6.1</td>
</tr>
<tr>
<td>Steroid withdrawal</td>
<td>0.4</td>
</tr>
<tr>
<td>Unclear</td>
<td>43</td>
</tr>
<tr>
<td>“Diverse causes”</td>
<td>10.4</td>
</tr>
<tr>
<td>Medication error</td>
<td>none</td>
</tr>
</tbody>
</table>

Poor hypoglycemia management and follow up was the rule

- < 50% with documented euglycemia within 2 hours of low
- Average time to documented resolution was 4 hrs, 3mins
- (median 2 hrs, 25mins)

Iatrogenic Hypoglycemia –
Risk Factors, Treatment, and Prevention

- 130 ward inpatients monitored for glucose
- 65 consecutive cases with iatrogenic hypoglycemic day
- Matched 1:1 with controls (monitored, similar hospital day, not hypoglycemic)
- Examine risk factors for hypoglycemia
- Study hypoglycemia treatment and adjustments made to prevent recurrence

Poor adherence to hypoglycemia management protocol. Suboptimal adjustment – opportunities to prevent hypoglycemia missed. Basal / nutritional 50:50 ratio lost….too much basal. Unexpected nutritional interruption not handled correctly.

Table 2. Final Multivariate Logistic Analysis Pseudo $R^2 = 66\%, \ P < 0.0001$

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>$P$ value</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.01</td>
<td>0.881</td>
<td>0.94–1.07</td>
</tr>
<tr>
<td>Sex</td>
<td>0.34</td>
<td>0.222</td>
<td>0.06–1.91</td>
</tr>
<tr>
<td>Congestive heart failure</td>
<td>6.35</td>
<td>0.111</td>
<td>0.65–61.47</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>5.16</td>
<td>0.131</td>
<td>0.61–43.30</td>
</tr>
<tr>
<td><strong>Nutritional interruption/discordance</strong></td>
<td><strong>12.09</strong></td>
<td><strong>0.032</strong></td>
<td><strong>1.23–118.05</strong></td>
</tr>
<tr>
<td>Poor hypoglycemic day</td>
<td>31.18</td>
<td>0.004</td>
<td>2.91–333.67</td>
</tr>
<tr>
<td>Insulin as outpatient</td>
<td>15.57</td>
<td>0.026</td>
<td>1.39–174.80</td>
</tr>
</tbody>
</table>
Iatrogenic Hypoglycemia from Insulin

Most common failures

1. Inappropriate prescribing

2. Failure to respond to unexpected nutritional interruption

3. Poor coordination of nutrition delivery, monitoring, and insulin delivery

4. Failure to respond to a prior hypoglycemic day

Guidance for Scheduled Temporary NPO
Example UC San Diego

- Basal / Nutritional / Correction insulin terms reinforced across orders, MAR, documentation venues
- New orders not required for temporary NPO

Insulin glargine (LANTUS) injection: “basal glargine insulin should still be administered even if the patient is temporarily NPO for a procedure, or has temporary interruption of procedure”

Nutritional RAA-I guidance for eating patients: “Give with first bite of food (or up to 30 minutes after first bite of food if patient is nauseated or has poor appetite). Give 0% if patient ate less than 50%, half if patient eats 50%, and full dose if they eat all / almost all of meal.”
Case
Critically ill 49 yo woman:
Unexpected interruption of nutrition

- 5 days s/p abd surgery and resolving sepsis
- On full tube feedings
- Insulin infusion at 4 units / hour, glucose 150 mg/dL
- No history of DM
- A1c 8.2

- Patient pulls feeding tube out….what do you do?
Unexpected interruption of enteral nutrition:

Appropriate actions include -

a) Stop the insulin infusion immediately, monitor frequently.

b) Replace enteral nutrition CHO with equivalent D10 by IV infusion, continue insulin infusion at same or slightly reduced rate.

c) Reduce insulin infusion to 1-2 units per hour, insure IV access x 2, monitor frequently until tube feeding can be adjusted.

d) Continue insulin infusion at same rate, A1c indicates DM is present and she should tolerate interruption of nutrition.

e) Either b) or c) are acceptable
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d) Continue insulin infusion at same rate, A1c indicates DM is present and she should tolerate interruption of nutrition.
e) Either b) or c) are acceptable
Nutrition on Hold Unexpectedly

Patient is unexpectedly made NPO or nutrition is on hold

Patient on insulin drip

Start D10 at tube feed infusion rate* (except patients with cerebral edema or hyponatremia)

Continue q1-2h monitoring

If BG<70 mg/dL or <80 mg/dL and symptomatic
Follow hospital hypoglycemia protocol.
●●●Recheck BG within 30 minutes●●●

If >2 consecutive BG<80 mg/dL, call MD. Pharmacy may be contacted for further consultation

Patient on subcutaneous insulin

For a patient with glargine insulin order

Continue glargine insulin. Consider reducing the dose by 20% if tight control or high risk of hypoglycemia

If BG<70 mg/dL or <80 mg/dL and symptomatic
Follow hospital hypoglycemia protocol.
●●●Recheck BG within 30 minutes●●●

Notify MD per protocol to start D10W at 40ml/hr. Pharmacy may be contacted for further consultation

For a patient with routine scheduled nutritional insulin order (regular or lispro)

Hold nutritional insulin, but continue correction insulin

Continue q4-6h monitoring
Clinical Informatics and Glycemic Control

- Clinical Decision Support
  - Order sets with embedded CDS
  - Computerized insulin dosing algorithms

- Month to Month reporting
- Flow sheets - Visual cues / graphics / trends
- Real time reports (hyper- and hypo- glycemic outliers, reports that capture patients “off protocol”)

An important part of a larger framework for improvement!
Active Surveillance

• Identify patients with a potential deficit in care, who are in the hospital right now.

• Triage tools to quickly determine if the patient is truly uncontrolled or “off protocol”.

• Intervene to bring onto protocol, reduce risk of glycemic excursions and continued deficits in care, provide ‘just in time’ education.

aka “measure-vention”
STROKE CODE - June 10

BG = 8
Recurrent hypoglycemia on same insulin doses for several days preceding stroke code.
Proposed CDS Display for hypoglycemia evaluation
– Federal Interagency Workgroup to prevent ADE

<table>
<thead>
<tr>
<th>Etiology of hypoglycemic event</th>
<th>ACTION taken to MITIGATE hypoglycemia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutritional interruption</td>
<td>Call to reduce hypoglycemic agent</td>
</tr>
<tr>
<td>Prior hypoglycemic event</td>
<td>Call to increase CHO</td>
</tr>
<tr>
<td>Excessive basal insulin dosing</td>
<td>Education/reinforcement of policy/protocols</td>
</tr>
<tr>
<td>Glycemic target too stringent</td>
<td>Other</td>
</tr>
<tr>
<td>Failure to discontinue oral hypoglycemic agents</td>
<td></td>
</tr>
</tbody>
</table>
Flow sheets: Useful from primary team AND for “Measure-Vention”

Triage report, investigation, and mitigation all within the EHR.
Virginia Mason example

Three clicks to order entry!
Iatrogenic Hypoglycemia from Insulin

Most common failures and strategies to address them

• Inappropriate prescribing
  – Standardized orders with embedded CDS – mandatory use
  – Ongoing monitoring for inappropriate prescribing, just in time intervention

• Failure to respond to unexpected nutritional interruption
  – Protocols and Education
  – Methods to reduce interruptions in tube feeding

• Poor coordination of nutrition delivery, monitoring, and insulin delivery
  – Clear directions in protocols and order sets
  – Regular education / competency training
  – Redesign process

• Failure to respond to a prior hypoglycemic day
  – Make sure ASSESSMENT is part of hypoglycemia protocol
  – Competency and case based-training
  – Monitor recurrent hypoglycemia rates
The Mentored Implementation Model

• Based upon model pioneered by Center to Advance Palliative Care
• Physician coaches with expertise and experience in effective implementation and QI, as well as topical expertise
• Mentoring occurs via monthly one-to-one calls, site visits and ad hoc communications
• Timely guidance, advice, and feedback
• Written summaries, ‘to do’ tasks, timelines
• “Mentor University” training
Mentored Implementation Collaboratives

• Data center with data upload and reporting capability
• Group educational webinars
• Topic-specific listserves and discussion forums
• Community website with topic-specific information, news and literature
• 3 mentored implementation program collaboratives with over 300 participants
• Glycemic control in over 100 sites
Implementation Guides / Resource Rooms

• Foundation of Mentored Implementation Model
  – QI fundamentals
  – Building a team
  – Metrics and evaluation
  – Gaining institutional support
  – Process mapping and needs assessment
  – Topic-specific interventions
  – Spreading Improvement

• Tools, links, annotated bibliographies, slide decks, etc
2011 Eisenberg Award Winner
NYSPFP Insulin Measure #1

Number of Unique Inpatients with At Least One Blood Glucose Result ≥200 mg/dL Per 100 Unique Inpatients Prescribed Insulin

Cumulative Incidence

- Oct-13: 64.89 (n=64)
- Nov-13: 62.45 (n=64)
- Dec-13: 62.18 (n=66)
NYSPFP Insulin Measure #2

Number of Unique Inpatients with At Least One Blood Glucose Result ≤50 mg/dL Per 100 Unique Inpatients Prescribed Insulin

- October 2013: 9.20 (n=64)
- November 2013: 10.04 (n=64)
- December 2013: 9.33 (n=66)
### Main Menu
- Hospital Master
- BOOST
- GCMI
- VTE
- MARQUIS
- Milestone Edits
- BOOST Mentor Library
- Unit Care Type Fixer

### Community
- BOOST
- VTE
- GCMI
- HP3

### Applications
- BOOST Applications
- GCMI Applications
- VTE Applications

### Extracts
- Extract
- Results Report
- Marquis Errors

### Support
- Powered by QuesGen
  © 2006-2012
- Terms of Use
- HIPAA Guidelines
- McAfee SECURE
- TESTED DAILY 23-AUG

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#### Hospital List

<table>
<thead>
<tr>
<th>Hospital Name</th>
<th>Hospital Type</th>
<th>City</th>
<th>State</th>
<th>Beds</th>
<th>Cohort</th>
<th>Mentor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baystate Medical Center</td>
<td>Academic Medical Center</td>
<td>Springfield</td>
<td>MA</td>
<td>560</td>
<td>10/10</td>
<td>Jeff Schnipper</td>
</tr>
</tbody>
</table>

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#### Data Filters

- **Start Month:** (choose)
- **End Month:** (choose)
- **Care Type:**
  - Critical Care Inpatient
  - Non-Critical Care Inpatient (Includes Telemetry)
  - Other Care Type (ED / PACU / Holding Units / Endoscopy Areas, Outpatient Surgery, Dialysis, Rehab, SNF, etc.)
- **Unit Type:**
  - Mixed Medical / Surgical (Includes Transplant)
  - Medical (Includes Oncology and BMT Units)
  - Surgical
  - Psychiatry or Behavioral
  - OB/GYN
  - Orthopedics
  - Pediatrics / Adolescent
  - Other
Hypoglycemia Reduction at UCSD
Simultaneous Improvement in Glycemic Control

![Graph showing patient-day glucometrics with trends over a period from 2011/04 to 2013/01. The graph compares the percent of days with glucose levels less than 40 and less than 70.](image-url)
UCSD - Secondary prevention of Hypoglycemia

Hypoglycemic Events Having ...

% of Patients

Period YYYY-MM

Percent of Patients with a Recurrent Hypoglycemic Day
### Glycemic Exposure, Glycemic Control, and Safety Parameters

<table>
<thead>
<tr>
<th></th>
<th>Patient - Stay</th>
<th>Patient - Day</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Day weighted mean glucose</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Hospital</strong></td>
<td>149.8</td>
<td>155.6</td>
</tr>
<tr>
<td><strong>Top Quartile</strong></td>
<td>≤ 151.6</td>
<td>≤ 155.7</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>156.9</td>
<td>161.2</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>159</td>
<td>163.1</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>112.9 - 184.8</td>
<td>122.4 - 183.5</td>
</tr>
</tbody>
</table>

| **Percent stays or days with uncontrolled hyperglycemia (mean glucose ≥ 180 mg/dL)** |                |               |
| **Hospital**        | 22.5%          | 25.7%         |
| **Top Quartile**    | ≤ 23.5%        | ≤ 25.6%       |
| **Mean**            | 27.2%          | 29.3%         |
| **Median**          | 28.4%          | 29.9%         |
| **Range**           | 4.4% - 43.2%   | 8.1% - 42.0%  |

| **Percent Readings per Stay in Range (71 - 179 mg/dL)** |                |               |
| **Hospital**        | 69.6%          |               |
| **Top Quartile**    | ≥ 68.7%        |               |
| **Mean**            | 64.8%          |               |
| **Median**          | 64.3%          |               |
| **Range**           | 54.3% - 85.6%  |               |

| **Percent of stays or days with hypoglycemia (<70 mg/dL)** |                |               |
| **Hospital**        | 8.7%           | 3.4%          |
| **Top Quartile**    | ≤ 10.5%        | ≤ 3.9%        |
| **Mean**            | 13.4%          | 5.1%          |
| **Median**          | 12.5%          | 4.7%          |
| **Range**           | 2.8% - 33.5%   | 1.8% - 14.8%  |

| **Percent of stays or days with severe hypoglycemia (<40 mg/dL)** |                |               |
| **Hospital**        | 0.8%           | 0.2%          |
| **Top Quartile**    | ≤ 1.0%         | ≤ 0.3%        |
| **Mean**            | 1.9%           | 0.5%          |
| **Median**          | 1.7%           | 0.4%          |
| **Range**           | 0% - 7.3%      | 0% - 2.4%     |

| **Percent of days with severe uncontrolled hyperglycemia (>299 mg/dL)** |                |
| **Hospital**        | 7.6%           |
| **Top Quartile**    | ≤ 8.0%         |
| **Mean**            | 10.2%          |
| **Median**          | 10.5%          |
| **Range**           | 1.8% - 17.7%   |
Benchmarking - Ranking bar chart - Hypoglycemia Management

Critical Care - Hospital Rank by Mean Time Between First Glucose <70 and Resolution
Benchmarking – Ranking bar chart

Glycemic control

Non-Critical Care - Hospital Rank by Percent Stays with Day Weighted Mean >= 180
Benchmarking Ranking Bar Chart

Hypoglycemia Rates

Non-Critical Care - Hospital Rank by Percent Days with Results < 70
SHM Benchmarking tools – Scatterplot
Uncontrolled hyperglycemia Y Axis
Hypoglycemia rate - X axis
Both are highly variable
A Series of Linked Protocols: Reinforce protocols by multiple methods, hardwire whenever possible

<table>
<thead>
<tr>
<th>Basic Protocols</th>
<th>Always More to Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC insulin</td>
<td>SC Insulin Pumps</td>
</tr>
<tr>
<td>IV infusion insulin</td>
<td>Monitoring</td>
</tr>
<tr>
<td>Periop management</td>
<td>Coordination: CHO / BG test / insulin</td>
</tr>
<tr>
<td>Hypoglycemia Management</td>
<td>Transitions</td>
</tr>
<tr>
<td>Patient Education</td>
<td>Provider Education / competency</td>
</tr>
</tbody>
</table>
Some designs don’t make any sense........

Even if they’ve been there a long time.
Safe Glycemic Control
A Team Sport

Questions and Comments?

Next Session - March 19th
Dr. Kristi Kulasa and Dr. Greg Maynard
- FAQs / Q&A
- Transitions
- Barriers and How to Overcome Them